

1. Identification data:

Name of the learning unit:	Mathematics
Guided time (theory and practice):	100 hours
Guided time per week:	5 hours
Total autonomous time:	20 hours
Modality:	Non scholarized
Number and type of academic period:	1° semester
Type of learning unit:	Mandatory
Cycle:	First
Curricular area:	Introductory to the profession initial training (ACFI-IP)
UANL credits:	4
Elaboration date:	16/03/21
Responsible for elaboration:	MC. Rodrigo Sepúlveda Saá LBG. Diana Massiel Aceves Agüero
Date of last actualization:	Does not apply
Responsible for actualization:	Does not apply

2. Presentation:

In this learning unit the student will be given the tools for the management of variables, as well as the possibility of applying them through structured exercises, allowing him to express arguments with a mathematical language and promoting the development of a logical thought.

During phase 1 "Basic algebraic operations and trigonometry", the student will learn to examine the concept of algebraic operations, remember the hierarchy of basic algebraic operations as well as define the basic concepts of trigonometry. Later in phase 2 "Linear equations, quadratics and systems of linear equations.", the student will memorize the characteristics of the straight-line equations, remember the linear and quadratic equation to give solution to each type of equation, in addition to implementing systems of linear equations through matrices, which will allow him to examine both types of behavior within algebraic functions. While in phase 3 "Exponential and natural logarithm function", you will be able to distinguish the behavior of the solutions of transcendental functions

mentioned above, infer the relationship that both types of functions keep, as well as their graphical behaviors and analyze the exponential growth and decay. Finally, within phase 4 "Trigonometric functions and biological application of functions", the student will observe the behavior of the sine, cosine and tangent functions and graph them, finally in this phase the biological uses of the functions seen throughout the Learning Unit will be applied. The student will achieve learning through evidence that develops their logical thinking, as well as the acquired skills, which will allow them to reach the integrative learning product, which consists of solving a series of cases of interest in the natural sciences, where the functions are applied as a method of solution and decision-making.

3. purpose:

The purpose of this learning unit (UA) is for the student to solve structured, descriptive and graphical examples, through identifying the characteristics of algebraic and trigonometric operations, as well as the types of functions. This is relevant to optimize biological, agricultural, forestry, natural and industrial resource management processes that generate a positive impact in the area of development of natural sciences.

It is related in a previous way with the knowledge acquired in mid-superior UAs offered by the UANL, particularly with the UA Development of the algebraic thought and Functions and relations since it is in these where the student acquires the bases referring to the algebraic language and properties of the real numbers that will allow him to course the UA of Mathematics with focus towards the Natural Sciences. Within its location in the first semester, it is directly related to the units of Inorganic Chemistry and Structural Biology which require the taking of data in the laboratory, as well as calculations of vital importance for decision-making and/or obtaining conclusions. In addition, it is related to subsequent UA of Calculus by building and developing the basic concepts of differential and integral calculus, to address problems specific to the area that will help decision-making during their professional development.

This UA contributes to the development of the general competences of the UANL, since the student knows the contexts in which the signs are immersed through the information, data, elements of the events and situations in the food area (2.1.2), as well as accepting the cultural and social diversity, adopting a critical approach when evaluating these situations from a numerical and analytical point of view (9.1.3) and the ability to react in a way positive in the face of differences of opinion and criticism of the teacher or other colleagues, which allow to generate an impartial collaborative work environment, through examples of situations of a biological nature that will be resolved as a team (15.1.1).

In addition, this UA contributes to the specific competence of the educational program of Biologist, through the integrative product of learning where it will have to interpret quantitative data for the monitoring of living components of an ecosystem, as well as abiotic factors (light, temperature, humidity, etc.), among other applications (E3-B).

In addition, this UA contributes to the specific competence of the educational program of Bachelor in Food Science, knowledge such

as the management and interpretation of functions, which are necessary to evaluate protocols related to food processing, applying the theoretical knowledge of the exact sciences in results of experiments or processes that allow the evaluation of physical, chemical and biological characteristics in raw materials and products, this will allow decision-making in the food industry, based on qualitative and quantitative data through objective and rigorous observations (E2-LCA).

In addition, this UA contributes to the specific competences of the educational program of Degree in Genomic Biotechnology, knowledge such as the management and interpretation of the functions, which are necessary to evaluate experimental protocols related to biological chemistry (E1-LBG), applying the theoretical knowledge of the exact sciences in results of experiments or processes that allow the conservation of biotic resources (E2-LBG), the implementation of analytical methodologies the detection of pathogens effectively in the health, economic and social field (E3-LBG). In addition, that, in areas of the health, agricultural, livestock, industrial and environmental sectors, the correct decision-making based on qualitative and quantitative data will benefit society in general through objective and rigorous decision-making (E4-LBG).

In addition, this UA contributes to the specific competences of the educational program of Chemistry, Bacteriology and Parasitology knowledge such as the management and interpretation of the functions, which are necessary to evaluate results in experiments or processes in any biological chemical field (E1-QBP), the implementation of analytical methodologies of biomedical, agricultural, industrial, environmental processes (E2-QBP) and the diagnosis of diseases (E3-QBP), as well as what is involved in the continuous improvement of all these processes, which will benefit society in general through the making of objective and rigorous decisions, based on an estimate of the algebraic and transcendental functions through all the evidences of this UA (E4-QBP).

3. Competencies of the graduation profile:

General competences to which this learning unit contributes:

Instrumental competences:

2. Use logical, formal, mathematical, iconic, verbal and nonverbal languages according to their stage of life, to understand, interpret and express ideas, feelings, theories and currents of thought with an ecumenical approach.

Personal and social interaction skills:

9. Maintain an attitude of commitment and respect towards the diversity of social and cultural practices that reaffirm the principle of integration in the local, national and international context in order to promote environments of peaceful coexistence.

Integrative competences:

15. Achieve the adaptability required by the uncertain social and professional environments of our time to create better living conditions.

Specific competences to which the learning unit contributes:

Biology

3. Propose strategies for the conservation, management and sustainable use of populations and ecosystems at the regional, state and national levels based on biological processes at different levels of organization, in accordance with social and economic needs within the legal framework to increase economic benefits to human populations through the management of natural resources.

Food Science

2. Optimize processes involved in food processing, by monitoring and evaluating the effect of process conditions on the physical, chemical and biological characteristics of raw materials and products, working in a multidisciplinary way, with respect for the environment to contribute to the improvement of the productivity of companies in the food industry.

Genomic Biotechnology

1. Design experimental protocols related to biological chemistry, using the theoretical, methodological and instrumental knowledge, traditional and cutting-edge, of the exact sciences, biology and chemistry, which are applied in the study of natural phenomena and biodiversity, in a logical, creative and purposeful way, in order to conserve biotic resources and the environment for the benefit of society.

2. Develop molecular diagnostics through the identification of pathogenic organisms, applying traditional and cutting-edge techniques effectively, as well as the use of innovative tools in their detection, which allow the study and treatment of genetic diseases in the health, economic and social fields.

3. Design strategies for the detection, modification and selection of genomes, through the identification of genes, proteins or cellular metabolic components, following the current regulations on biosafety of Genetically Modified Organisms (GMOs) and evaluating their

competitive advantage when compared to what is traditionally used, in order to develop biotechnological products, processes and services in the health sectors , agricultural, livestock, industrial and environmental.

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2. Develop molecular diagnostics through the identification of pathogenic organisms, applying traditional and cutting-edge techniques effectively, as well as the use of innovative tools in their detection, which allow the study and treatment of genetic diseases in the health, economic and social fields.

3. Design strategies for the detection, modification and selection of genomes, through the identification of genes, proteins or cellular metabolic components, following the current regulations on biosafety of Genetically Modified Organisms (GMOs) and evaluating their competitive advantage when compared to what is traditionally used, in order to develop biotechnological products, processes and services in the health sectors , agricultural, livestock, industrial and environmental.

Chemistry, Bacteriology and Parasitology

1. Design experimental protocols related to biological chemistry, using the theoretical, methodological and instrumental knowledge, traditional and cutting-edge, of the exact sciences, biology and chemistry, which are applied in the study of natural phenomena and biodiversity, in a logical, creative and purposeful way, in order to conserve biotic resources and the environment for the benefit of society.

2. Implement analytical methodologies in chemical-biological, microbiological and biotechnological laboratories that are applied to biomedical, agricultural, industrial and/or environmental problems, to provide results supported by the validation of the processes used, for the benefit of the health and economy of the community.

3. Contribute to the diagnosis of autoimmune, metabolic and infectious diseases through the biochemical study of the cellular response in living beings, to contribute to the treatment that guarantees an optimal state of health.

4. Develop systems of continuous improvement and quality assurance of chemical-biological, microbiological and biotechnological processes, applying current national and international regulations through compliance with the established requirements, to determine in a rigorous and objective way the properties of the products obtained, for the good of society.

5. Phase structure

Phase 1: Basic algebraic operations and trigonometry

Element of competence:

Identify algebraic operations and basic trigonometric functions for the solution of various equations respecting the hierarchy and method of solution.

Evidence	Performance criteria	Learning activities	Content	Resources
1. Questionnaire of basic algebraic operations, trigonometry	<p>Write your answers in an orderly, clear, and concise manner.</p> <p>Includes personally identifiable data.</p> <p>Present your questionnaire in a handwritten and/or resolved way on a digital platform in a timely and clean manner.</p> <p>He presents his work in the format established by the teacher.</p>	<p>The professor introduces the UA by presenting the analytical program.</p> <p>At the beginning of the learning unit, the student presents a diagnostic test.</p> <p>The teacher uses a flowchart with the contents of the learning unit to plan and describe each of the learning unit's activities.</p> <p>Students in a group way solve problems of</p>	<p>Operations Hierarchy</p> <p>Basic operations in algebra (addition, subtraction multiplication, division)</p> <p>factorization</p> <p>Simplification of Rational Expressions</p> <p>Pythagoras theorem</p> <p>Circular Angle Measurement System</p>	<ul style="list-style-type: none"> ● Baldor, A. (2017). Capítulo 1-5. ● Baldor, A. (2020). Capítulo 22-27. ● Lehmann, CH. (2016). Capítulo 1 y 2. ● Cuestionario ● Pizarrón <p>Interactive Software:</p> <p>Plataforma Nexus</p> <p>TEAMS Platform</p> <p>Thatquiz Platform</p>

	<p>Includes all operations needed to get to the answer on each of the questions.</p> <p>Identifies algebraic operations and their rules.</p> <p>Identifies the concept function.</p> <p>Solve algebraic operations.</p> <p>Identifies complementary and supplementary angles</p> <p>Correctly solves trigonometry questions.</p> <ul style="list-style-type: none"> • Attach your questionnaire on the university digital platform Nexus or MS Teams, within the delivery time. 	<p>hierarchy of the fundamental operations of algebra on the blackboard.</p> <p>Students through brainstorming explain the concepts and properties of trigonometric functions of supplementary and complementary angles, as well as the circular system of measuring angles and their signs according to the quadrant in the Cartesian plane.</p> <p>The students, in group work and guided by the teacher, perform exercises that allow them to apply the knowledge acquired in this phase.</p> <p>Weekly, in extra-classroom hours, students through digital platforms (e.g., ThatQuiz), solve</p>	<p>Trigonometric Functions of complementary and supplementary Angles</p> <p>Signs of trigonometric functions according to the quadrant.</p> <ul style="list-style-type: none"> • Trigonometric ratios. 	<ul style="list-style-type: none"> • Mathematical (2020). • WolframAlpha (2020). • Geogebra (2020). • Xrjunque (2020).
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		<p>exercises according to the theme seen in class, in order to integrate knowledge.</p> <p>At the end of the phase, the student uses the different platforms (interactive software) in order to apply the knowledge acquired as a way of integrating concepts.</p> <ul style="list-style-type: none"> The student individually presents the 1st written partial exam: Algebraic operations linear and quadratic equations (weighted activity 1.1) 		
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Phase 2: Linear, quadratic equations and systems of linear equations

Element of competence:

Identify the solution methodologies in linear equations, quadratic equations and systems of linear equations based on their characteristics to contribute to the interpretation of scientific data.

Evidence	Performance criteria	Learning activities	Content	Resources
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<p>2. Laboratory of linear and quadratic equations exercises.</p>	<p>Includes personally identifiable data.</p> <p>He presents his work in the format established by the teacher.</p> <p>It presents its procedures and results in an orderly, clear and concise manner.</p> <p>Deliver your exercise laboratory in a handwritten and/or resolved manner on a digital platform in a timely manner and cleanly.</p> <p>It presents correctly resolved all the exercises provided in the laboratory.</p> <p>It includes all the operations necessary to arrive at the answer in each of the exercises.</p>	<ul style="list-style-type: none"> • The teacher exposes the principles or foundations of the straight line. • The students, organized by teams, solve problems of the straight line to differentiate their forms and interpret the different components of their corresponding graph, and thus be able to apply them in the solution of problematic situations of their area of competence. • In the straight line and its graph, the student explains with his words examples where these functions are used in everyday life. • Individual students research the principles and foundations of linear 	<ul style="list-style-type: none"> • Solving equal and unequal equations • Linear function and its graphical representation. • Systems of linear equations. • Fundamental operations with Matrices. • Properties and Methods for valuing a determinant. • Solution of systems of linear equations with Matrices and Determinants. • Quadratic function and its graph. • Quadratic equation and its solution. 	<ul style="list-style-type: none"> • Baldor, A. (2017). Capítulo 20-21. • León Cárdenas (2011). Capítulo 3-5. • Ledder, G. (2013). Capítulo 6 y 7. • Lehmann, CH. (2016). Capítulo 3-6. • Ortiz Campos, F., <i>et al</i>, (2013) Capítulo 3. • Laboratorio • Pizarrón <p>Interactive Software:</p> <ul style="list-style-type: none"> • Plataforma Nexus • Thatquiz Platform • TEAMS Platform • Khan Academy (2020). • WolframAlpha. (2020).
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	<p>Identifies the dependent and independent variable of the linear function, as well as the intersection with the axes.</p> <p>Interprets the behavior of graphs.</p> <p>It develops the system of linear equations.</p> <p>Identifies the method of solving systems of linear equations.</p> <p>Solves the matrix and quadratic function exercises.</p> <p>Identifies the element of an array, as well as its position in the array.</p> <p>Identifies the dependent and independent variable on a graph.</p> <p>Properly plot a quadratic function.</p>	<p>equation systems and their methods of solution, to participate in class through teacher-guided questions and answers.</p> <ul style="list-style-type: none"> • Students, organized by teams, solve problems of systems of linear equations to distinguish or differentiate the different methods of solution of these systems. • The student reviews the bibliographic material on the principles and foundations of the quadratic function, as well as its graphic representation. • Weekly, in extra-classroom hours, students through digital platforms (e.g., ThatQuiz, MS TEAMS), solve exercises according to the theme seen in 		
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	<ul style="list-style-type: none"> Identifies the domain and range of each function. 	<p>class, in order to integrate knowledge.</p> <ul style="list-style-type: none"> At the end of the phase, the student uses the different platforms (interactive software) in order to apply the knowledge acquired as a way of integrating concepts. The student presents the 2 second theoretical exam (Ponderable Activity 2.1) 		
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Phase 3: Exponential and natural logarithm function.

Element of competence:

Explain exponential growth or decay through identification of the exponential function and natural logarithm by inferring its graphical behavior for the interpretation of data related to the biological sciences.

Evidence	Performance criteria	Learning activities	Content	Resources
3. Report of case solving of equations and exponential and logarithmic functions.	<ul style="list-style-type: none"> Write your report in an orderly, clear, and concise manner. 	The teacher explains the concepts and properties of the exponential function	<ul style="list-style-type: none"> Exponential function and natural logarithm, with their respective graphs. Fundamental properties of logarithms. 	<ul style="list-style-type: none"> Ortiz Campos, F., <i>et al</i>, (2013) Capítulo 7. Lehmann, CH. (2016). Capítulo 16.

	<p>Includes personally identifiable data.</p> <p>It presents its case resolution report in a handwritten and/or resolved manner on a digital platform in a timely and clean manner.</p> <p>Includes all content covered in this phase.</p> <p>He presents his work in the format established by the teacher.</p> <p>Use the nexus or MS Teams university digital platform to document your evidence.</p> <p>It includes all the operations necessary to arrive at the answer in each of the exercises.</p> <p>Identifies the corresponding function.</p>	<p>and the natural logarithm.</p> <p>The student in teams investigates how to graph these functions, to explain an example on the blackboard to their peers.</p> <p>Students in group work solve the graphs of exponential and natural logarithm functions, as well as exponential and logarithmic equations.</p> <p>For each type of function, the teacher shows his students examples where these functions are used in everyday life.</p> <p>Weekly, in extra-classroom hours, students through digital platforms (e.g., ThatQuiz, MS TEAMS), solve exercises according to the theme</p>	<ul style="list-style-type: none"> • Solving exponential and logarithmic equations. • Exponential growth and decay 	<ul style="list-style-type: none"> • Pizarrón • Laboratorio <p>Interactive Software:</p> <p>Plataforma Nexus</p> <p>Thatquiz Platform</p> <p>TEAMS Platform</p> <ul style="list-style-type: none"> • WolframAlpha (2020). • Khan Academy (2020).
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	<p>Identifies the dependent and independent variable of the natural and exponential logarithm function.</p> <p>Identifies the asymptote.</p> <p>Determines the domain and range of the exponential and natural logarithm functions.</p> <p>Solves the exercises of the fundamental properties of logarithms.</p> <ul style="list-style-type: none"> Identifies exponential growth or decay. 	<p>seen in class, in order to integrate knowledge.</p> <p>At the end of the phase, the student simulates the optimization of the functions through the interactive software</p> <ul style="list-style-type: none"> Student submits the 3rd weighed written midterm exam (Ponderable Activity 3.1) 		
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Phase 4: Trigonometric functions and biological application of functions.

Element of competence:

Interpret the functions of calculating a variable (linear, quadratic, exponential, logarithmic, and trigonometric) to holistically understand the experimental results.

Evidence	Performance criteria	Learning activities	Content	Resources
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<p>4. Report of trigonometric functions and biological application exercises</p>	<ul style="list-style-type: none"> Write your report in an orderly, clear, and concise manner. <p>Includes personally identifiable data.</p> <p>Present your evaluation report in a handwritten and/or digital platform in a timely and clean manner.</p> <p>Includes all content covered in this phase.</p> <p>He presents his work in the format established by the teacher.</p> <p>It includes all the operations necessary to arrive at the answer in each of the exercises.</p> <p>Identifies sine and cosine function.</p> <p>Identifies the dependent and independent</p>	<p>The teacher explains the concepts and properties of trigonometric functions, as well as their corresponding graphs.</p> <p>Students, in group work, conduct research on the different types of trigonometric functions.</p> <p>The students investigate by team applications of the functions in the biological field in databases of the UANL.</p> <p>Students guided by the teacher solve exercises related to the area of study of the natural sciences, either by the traditional method or through interactive software.</p> <p>Weekly, in extra-classroom hours, students through digital</p>	<ul style="list-style-type: none"> Trigonometric functions (sine, cosine, tangent) Sine and Cosine Function Plot Mathematical models of functions applied to the natural sciences. <ul style="list-style-type: none"> linear quadratic exponential logarithmic Trigonometric 	<ul style="list-style-type: none"> Ortiz Campos, F., <i>et al</i>, (2013) Capítulo 8. Mareček, V., <i>et al</i> (2017). Pizarrón Reporte de problemas <p>Interactive Software:</p> <ul style="list-style-type: none"> American Meteorological Society. (2020) Mathematical (2020). WolframAlpha. (2020). Plataforma Nexus Plataforma Thatquiz Plataforma TEAMS
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	<p>variable of the trigonometric function (sine, cosine).</p> <p>Determines the domain and range of trigonometric functions.</p> <ul style="list-style-type: none"> • Solves and interprets exercises of functions applied to biological systems 	<p>platforms (e.g., ThatQuiz, MS Teams), will solve exercises according to the theme seen in class, in order to integrate knowledge.</p> <p>The student presents the fourth weighed written part-exam (weighted activity 4.1).</p> <ul style="list-style-type: none"> • The student presents the practical examination of cases of importance in the natural sciences, based on the behavior of their functions for decision-making (weighted activity 4.2) 		
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6. Evaluación de los aprendizajes:

Fase		Ponderación
1	Evidence 1. Questionnaire of Basic Algebraic Operations and Trigonometry.	5 points
	Weighted activity 1.1. First written partial exam: Basic algebraic operations and trigonometry.	10 points
2	Evidence 2. Laboratory of linear and quadratic equations exercises.	5 points
	Weighted activity 2.1: Second written partial exam: Linear, quadratic equations and systems of linear equations	11 points
3	Evidence 3. Case solving report of exponential and logarithmic equations and functions	5 points
	Weighted activity 3.1. Third written partial exam: Exponential and natural logarithm function.	12 points
4	Evidence 4. Report of evaluation of trigonometric functions and exercises of biological application	5 points
	Weighted activity 4.1: Fourth written midterm exam: Trigonometric functions.	12 points
	Weighted activity 4.2: Practical exam based on case applications in natural sciences.	15 points
	Integrative product	20 points
	Total:	100 points

7. Integrative product:

Written report on case solving algebraic operations, trigonometric and functions applied to the natural sciences. (See Annex 1).

8. Literature:

- American Meteorological Society. (2020) AMS. From <https://journals.ametsoc.org/> (UANL digital library).
- Baldor, A. (2017). Algebra. Ed. 3. Editorial Patria.
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Anex 1 PIA Instructional guide

Integrative learning product: Written report on case solving algebraic operations, trigonometric and functions applied to the natural sciences.	
Instructions:	The students will carry out a series of cases, where the contents learned in each of the phases of the learning unit are applied in a real context, these cases will be provided by the teacher.
Value:	20 points
Evaluation criteria:	<p>The integrative learning product has the following features:</p> <ol style="list-style-type: none"> 1. The number of exercises requested by the teacher. 2. The procedures of all the exercises ordered. 3. Deliver in physical and / or electronic format as requested by the professor of the UA. 4. Include the identification data of the equipment. 5. Actively collaborate with the members of your work team. 6. Submit the PIA on time. 7. Attach the final project on the Institutional Digital platform, either NEXUS or MS Teams. 8. Identify the nature of the problem. 9. Propose a methodology to solve the case. <ul style="list-style-type: none"> ● Correctly resolve each exercise.
mode:	Team